THE ELECTRICAL WORLD

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Electric Railways.—VI.

(*Continued from page* 1.)

We have been considering in our preceding articles the principles governing electrical railway appliances. We now proceed to describe and consider some of the devices which have been made, used or proposed in carrying into practice the principles. This will not be done in the chronological order of their inception or application, but in an order warranted by reason of prominence, local interest, novelty or other qualification.

During at least thirty years there has been a continual demand by the citizens of New York City for the relief of traffic on the city's principal thoroughfare, Broadway. Owing to the city's location, and the conformation of its streets, Broadway, being centrally located and stretching many miles from the southern to the northern confines of the narrow island, naturally, as well as conveniently, became the main artery of travel. Its crowded condition necessarily retards travel upon it, and with the growth of the city the difficulties increase.

Furthermore, that which is a beautiful street, architecturally considered, is disfigured and incumbered by an immense number of poles bearing innumerable wires of telegraph and telephone companies. It is crossed and recrossed in every direction by other wires, so much so as to resemble a gigantic, unsymmetrical spider's web, exceedingly unpleasant to view and dangerous to life and property for various reasons which have been fully discussed in the columns of THE ELECTRICAL WORLD and in the daily press.

Many plans have been devised for facilitating travel on this street, which from the causes we have named has become the track for goods transportation rather than a pleasant way for the pleasure seeker and the buyer. But all tunnels, arcades, open cuts, underground railways, surface and cable railways have been voted impracticable for reasons too numerous to be considered here. The main reason is the impossibility of overcoming not only artistic objections, and those of property holders along the street, but the engineering difficulties presented.

With the advance of scientific investigation and invention new means of accomplishing desirable ends are presented to the engineer, and in no line is this fact so notable as in electrical invention relating to the distribution of power as applied to locomotion. Though the idea of electric railways is quite as old as railways themselves, it is only within a brief period that the details of cheap and reliable production of electricity and its application to motors have been practically accomplished. We have not so far given any of the history of the art of electric locomotion, because it has not been necessary within the scope of our articles. Suffice it for the present to say that the thing is an accomplished fact, and will go into use wherever its virtues recommend it, and whenever the public recognizes them.

Electric locomotion seems to furnish means whereby the problems relating to Broadway may be solved with less time, labor and difficulty, and with greater success in all the features, than by any other known way.

We illustrate herewith a plan invented by Col. Rowland R. Hazard, of New York City, for the relief and benefit of Broadway. The essential feature is the way in which he provides for an electric railway, for the accommodation of its passengers, and for the placing of the objectionable electric wires under the surface of the street, and as well as for room for the existing sewer, water, gas and steam pipes.

The invention he has denominated, with reason, "The Scientific Street." He thus concisely states the case: "The capital requirement of a great modern city is the Scientific Street. Upon it depend the convenience, prosperity, health and comfort of its citizens.

"The main arteries of travel, such as, for example, the Strand and Oxford street in London, Broadway in New York, and the Boulevards de la Madeleine, des Capucines, des Italiens, Montmartre, Poissonniere, Nouvelle, and St. Denis in Paris, must, in addition to being clean, noiseless, smooth and unobstructed, accommodate a vast traffic of two distinct classes—one class availing itself of the central disposition of the streets to travel rapidly from one point to another distant therefrom; and the other consisting of those who wish to reach some point on the street itself. The one requires the most rapid possible transmission, and the other the most rapid transit consistent with frequent opportunities for stopping.

"Such streets, too, are and must always be used for certain services which are indispensable to modern life, such as sewage, water supply, gas, steam and pneumatic pipes and electric wires. The attempt to provide for all these things has been made wherever the occasion has arisen, but being governed in great degree by conditions which were imposed before the demand had fully arisen, the success attending these efforts has nowhere been complete.

"To the American, Broadway is at once the most familiar and complete example of the requirements and the failure. No other street in the world has the same relative importance, and no other such street presents so deplorable an appearance. The hideous wilderness of poles and wires finds a counterpart of ugliness in the broken and wrecked surface of the street, and in the gallows-strewn house-tops. The noise of traffic renders conversation upon and near the street difficult and exhausting. The noise is indescribable and traffic is obstructed."

Fig. 1 represents a cross-section of the proposed Broadway Electrical Road. In its construction the first operation is, after making the necessary excavations, to build the granite retaining-walls *E E* at the line of the curbs *Q Q*. The tops of the walls become the curbs, so that the present sidewalks *U U*, and vaults *V V* under them, are not disturbed. The depth of the excavation from curb to curb is about 16 feet, and its width is 44 feet. Five lines of granite foundations *F F F* are built, and on them are erected, at suitable distances apart, columns *C C*, of angle steel. This structure is covered by a roof *R*, composed of steel stringers and girders supporting a continuous corrugated covering made of steel buckle-plates with their convex sides uppermost, and riveted together as one. Such a roof is very strong, and does not change dimensions as a whole under variations of temperature. It is supported by the five lines of posts constituting parts of the partitions *C C*, and is thus rendered strong enough to bear safely the heaviest traffic possible on Broadway.

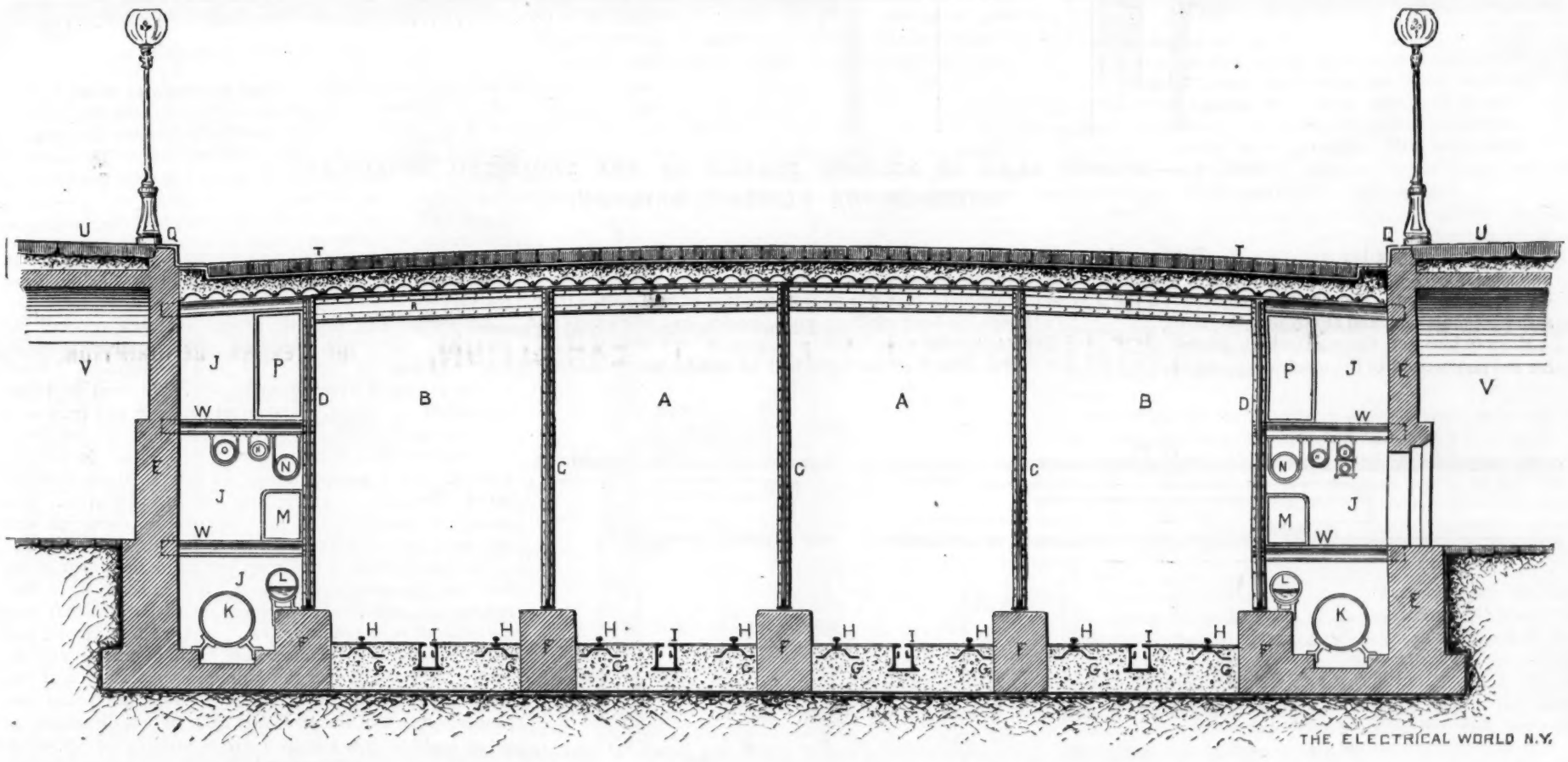

FIG. 1.—THE SCIENTIFIC STREET—A PLAN FOR AN ELECTRIC RAILWAY UNDER BROADWAY, PROVIDING ALSO FOR WIRES, PIPES, ETC.

The buckle-plate roof is to be covered with a layer of asphalt and then with one of concrete. This last is to be paved with creosoted wooden blocks after the manner of the Paris wooden pavements, in order to reduce noise. Of course stone pavement may be used. The concrete and asphalt coverings effectually protect the plates from access of moisture from the street.

The spaces between the posts *C C* are filled by panels made of thin, non-resonant material, such as may be constructed of wire cloth or net-work covered and filled with fibrous material made adhesive and cohesive by oxidizable vegetable oils, etc.

The two outer divisions next to the curb walls are divided into stories or galleries *J J J*, by beams *W W*. These beams may, or not, be floored. In these galleries are laid

or supported the conduit *P* for electric wires; the water-mains *K*, the sewers *L*, the steam-heating pipes *M*, the gas pipes *N*, etc. Through the galleries these wires and pipes are easily accessible for additions, renewals or repairs. Doors may be placed at convenient places, so that access may be had from some of the vaults *V*. The main entrances are by doors at the stations.

The tunnels *A A B B* have floors *G* of concrete and asphalt laid in them. In the floors are placed longitudinal steel sleepers supporting steel rails *H*. Between the rails and sleepers are layers of tarred felt for the purpose of deadening sound. The asphalt covering of the tunnel floors prevents dust and annoyance therefrom.

Midway between the rails of each tunnel the conduit *I*, for the conductors of the electric current used for the railway, is constructed. This conduit consists of an iron channel-way, nearly closed at the top, leaving a slot, within which is the lever used to electrically connect the motor of the locomotive with the conductors supported therein on the sides of the conduit. The mode of taking the current from these conductors is substantially like that described in Article V. of this series.

The electric railway system which is now proposed to be used is that of Bentley and Knight, at present in operation in Cleveland, O., on a surface railroad. This system is based upon the *series* plan which has been set forth in the preceding articles and in the article on "Telpherage" in the issue of The Electrical World of May 10th, 1884.

The qualities of this system, most of which qualities, however, belong to all electric railway systems, have been set forth as follows: *Safety.—Derailment* is impossible. Curves can be taken shorter, more quickly, and safely. The train is always held at a fixed-block, hence *no collision* by meeting, or overtaking, *can occur*. It will stop automatically in case of accident or fracture. The train *cannot start until its doors are closed, and the doors will not open until the train has stopped.*

Comfort.—There is no consumption of coal on the train, hence no heat, cinders, gases, smoke, dust or steam, and no delays for "coaling" or "watering."

The motion of the train will be steady, no "pounding" or clatter of rails, but a gliding motion. The "start" and "stop" will be quick and perfect. There will be no collisions or confusion among passengers on entering and leaving the car, as each car will always stop exactly at the same place. A mark on the platforms and a corresponding one on the doors will show the "*in*" passengers where to wait and enter, and the "*out*" passengers where to alight, without confusion or contact.

The lighting will be by incandescent electric lamps. Upon leaving a station the name of the next will appear, and on approaching it a bell will strike to arrest attention.

Regularity.—The same speed can be maintained on up as on down grades. Trains may always be "on time," may follow each other as rapidly as required, with absolute safety, and with frequency limited only by the length of the stop in receiving and discharging passengers. One-minute headway is proposed for *way*, and three minutes for *express* trains.

Speed.—Any practicable speed can be taken, and quick starts and stops, quick up-grades, quick curves, no "delays of precaution" and none from confusion and blocks among "in" and "out" passengers, will reduce schedule time materially.

Economy.—The central generating stations will be placed at tide-water, the point where coal is cheapest. The reduction in the pay roll will be enormous. Nearly everything is done automatically. No coal or water is handled on trains. Brakemen, firemen and trackmen are dispensed with. Fewer conductors are required. No dead-weight of coal, water, boiler or furnace is carried. The "wear and tear" of heavy locomotives is saved. There is no waste-space for car platforms. The energy of stoppage and down-grades is conserved, and will store current to light the cars, stations and switches.

The construction of roadway we have described gives four parallel tunnels, each about 8 feet 8 inches wide and 13 feet high, and closely enveloped on all sides, so that they are tubes of rectangular section. *A A* are for express, and *B B* for way-trains. The cars are made in cross-section to nearly fill the section of the tubes, so that they may be likened to a loosely fitted piston. When the trains are running, much of the air before each train is displaced, as before a piston, into the open air at suitable outlets, as at stations, and fresh air rushes in behind the trains through inlets. In this way the perfect ventilation of the tunnels is provided for, and a very serious objection to all preceding underground railways obviated.

The cars are built of a metallic, webbed skeleton, filled in with fibrous adherent and coherent material. This construction is strong, light and safe from breakage, and therefore cannot be dangerous to passengers from flying fragments and splinters in case of accident.

The doors of the cars are near the ends, and there are no windows, but the cars will be brilliantly lighted by electricity. Ventilation of the cars is secured by opening suitable inlets at the forward and rear ends, so that air may pass from front to rear during movement of the train.

Fig. 2 is a ground plan of an express station. All stations are to be located at the crossing of the streets, and the entrances will be on the cross streets by stairways located next to the buildings. At way stations the passenger platforms will be under the sidewalks on both sides, because only the trains in tunnels *B B* will be there used.

At express stations, which will be also way stations, a somewhat different arrangement will be made. At proper distances either side of the station the tunnels *B B* will be curved outward so as to run under the sidewalks and will also be depressed a few feet in order to provide room for a gallery or passage way, connecting the opposite entrances, over the four tracks. The express tracks will keep their direct course, only depressed to the lever of the way tracks. Two platforms, one on each side of the two express tracks, and between them and the way tracks, are provided for access for entry and exit to the cars of both classes. Passengers descend from or ascend to the gallery to or from the platforms. They may take the express trains to near their destinations and exchange at

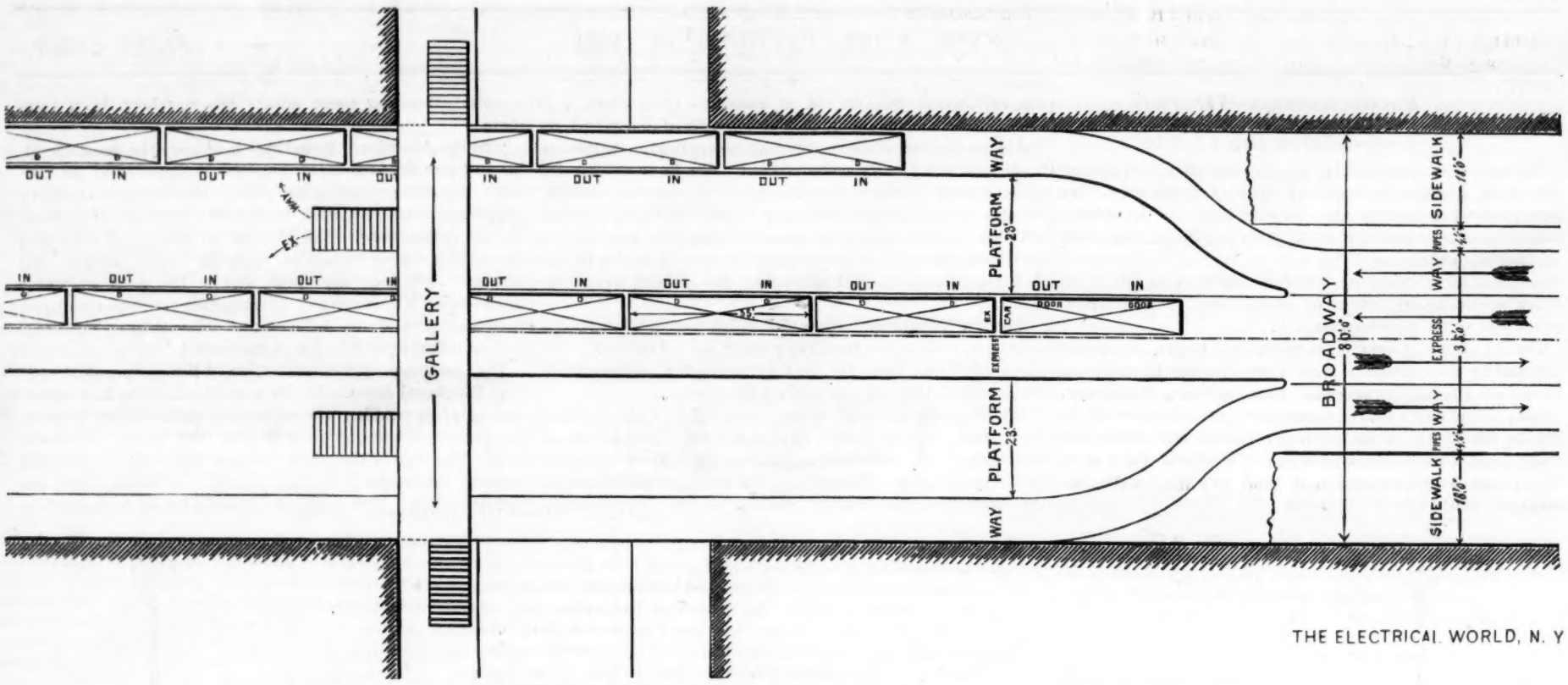

FIG. 2.—GROUND PLAN OF EXPRESS STATION OF THE PROJECTED BROADWAY UNDERGROUND ELECTRIC RAILWAY.

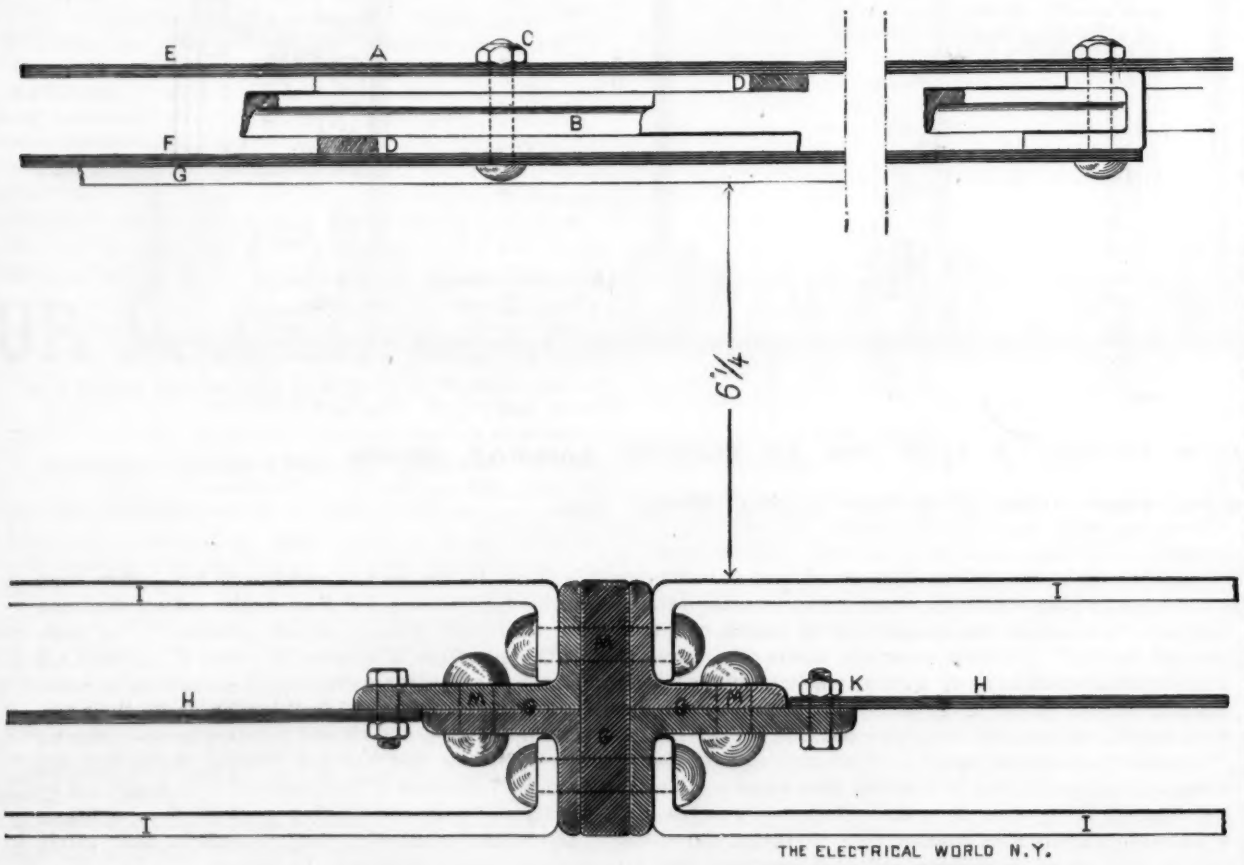

FIG. 3.—SECTIONAL DETAIL, SHOWING THE RELATION BETWEEN TUNNEL AND CAR.

the nearest express station for the way trains, and *vice versa*.

Fig. 3 is a sectional detail showing the relations between one wall of each of tunnel and car. *A* represents the inside of car; *B* the frame; *C* bolts; *D* braces; *E*, *F* non-resonant walls of cars; *G* cornices of cars; *H* non-resonant walls of tunnels; *I* deflecting plate; *K* clamping-bar, and *M* bolts, mild-steel core of column.

We are indebted to Frederick N. Blanc, C. E., assistant engineer of the Broadway Underground Railway Co., for access to the company's drawings.

The railway gauge is the standard one of 4 ft. 8½ inches, so that the cars may be run upon all connecting railways, as through the Fourth Avenue Tunnel, and with the railways on the other side of the Harlem River.

At the express and other stations the galleries for wires and pipes are either depressed or deflected from the direct course to make room for station purposes. The system of associating the wires will be any one which practically provides against the evils of induction between them. This *desideratum* has been attained by some systems, so that such an objection cannot be urged against putting wires below the surface.

The work of construction can be carried on with little obstruction to existing traffic on the streets, and when it is finished, for it, or something better now unknown, will be before long, the citizens of New York will have a "Scientific street," not too scientific, but just scientific enough to be eminently practical under existing engineering knowledge and opportunities.

We have described an electric way for electric communication by person and word. It provides for the requirements of the case, and therefore must and will be built.

(TO BE CONTINUED.)

A Telegraph Company Enjoined.

An injunction restraining the International & Eastern Telegraph Company from attempting to enforce the payment of a note for $15,000, given by the Bankers & Merchants' Telegraph Company, and from selling, pledging, or parting with any of the mortgage bonds of the Bankers & Merchants' Company, was granted by Judge Bartlett, in the Supreme Court, Chambers, on Aug. 8. The Bankers' Company alleges that on March 29, 1884, the International Company pretended to sell it certain telegraph lines, poles and wires between various points in the State, for which it agreed to pay $25,000 in cash and $40,000 in its first mortgage bonds. Subsequently this agreement was changed, and the Bankers' Company paid to the International Company $10,000 in cash and gave a note for $15,000, payable in 60 days. The note was secured by $30,000 worth of the general mortgage bonds of the Bankers' Company. This agreement was accepted by the International Company, but so far, it is claimed, the International Company has failed to convey any title whatever to the property. It is also claimed that the consideration of the note has failed and that the agreement has not been ratified by a three-fifths vote of the Directors of the International Company or of a majority of the stockholders. Payment of the note was refused Aug. 2 on the ground that the Bankers' Company has received no consideration. With the understanding that the International Company was about to enforce payment of the note and to sell the mortgage bonds held as collateral, the injunction was applied for.

In speaking of the injunction granted by Judge Bartlett, F. E. Trowbridge, President of the International Company, said that a misapprehension had arisen among business men regarding the relations existing between the two companies. "The facts," said he, "are that we sold to the Bankers and Merchants' Telegraph Company a line, for which we received a certain number of bonds and a draft on A. W. Dimock & Co. for $25,000 due in 60 days. This was accepted by them March 29, 1884. In the meantime Dimock & Co. failed, and the note was protested.

"The Bankers & Merchants' Company then gave us $10,000 cash and a new note for $15,000, to run for 60 days, with interest, on which certain bonds were given as collateral security. They applied to me last Thursday to extend this note for 30 days. I declined, unless they would pay something on account. They said they had no money and could not pay me anything, but hoped to pay within 30 days. I told them that the note must be protested, and that I should sell the bonds according to contract Then the Bankers & Merchants' Company secured the injunction restraining us from selling the collateral."

LIGHTNING STROKES.—Charts of the geographical distribution of the lightning strokes for 1882 and 1883, prepared from our fire records, show that they are chiefly confined to that part of the country situated north of the Ohio River and east of the Missouri River. In both years, 85 per cent. of all the strokes occurred within this area. In the Southern States lightning seems to be comparatively rare, and seldom occurs outside of three States—Texas, Louisiana and Georgia. There seem to be two principal centres of electrical disturbance, from the fire underwriters' standpoint, and these are in the New England and Northwestern States. Sixty-five per cent. of the strokes happen in the summer; the remaining 35 per cent. are divided between spring and autumn in about equal proportions.—*Insurance Chronicle.*

Navigation in Fogs.

The loss of the steamer Amsterdam off Sable Island last week, in a heavy fog, has attracted considerable attention. The Amsterdam sailed from the city of that name on July 19, and enjoyed fine weather nearly the whole way across the Atlantic. As she approached the stern Canadian coast on her way to New York, she encountered a heavy fog. Her officers were unable to take observations of the heavens, and apparently did little in the way of ascertaining her position by soundings. The result was that the Amsterdam drifted some thirty-five miles out of her course and struck a sand-bar near Sable Island. The passengers and crew, about two hundred and sixty souls in all, were landed on the island by the ship's boats, and it is ascertained that only four of them were lost. Fortunately the sea, as is usual in the case of fogs, was comparatively smooth; otherwise all might have perished.

This occurrence has been generally made a text from which to preach a sermon on the impropriety and danger of pushing ahead in fogs, and the warnings that are given on the subject are no doubt excellent; but science now comes forward and offers her help. As readers of this paper are aware, Capt. Lina Beecher has recently invented a very ingenious portable telephone apparatus. The application of this to navigation renders it wholly unnecessary that ships should lie to in fogs. We give on this page two small cuts to illustrate roughly the manner in which the portable telephone can be used at sea. All that is necessary is that the portable telephone reel with one of the telephones shall be carried on board a small ship's boat or steam launch, while the other telephone is retained on the steamer. The small boat can now act as a pilot during the densest fog or on the darkest night. The crew of the small boat or launch can take soundings or other observations, and report at given intervals of time to the steamer with which it is connected by the light telephone cable. Practically, any length of cable can be run out from the telephone reel, but for navigation purposes the boat need only be a few hundred yards ahead. The apparatus is so simple that any able seaman can work it. In this way a steamer or man-of-war can pick her road with safety along a rock-bound coast or through the most dangerous shoals and reefs. If it be assumed that the telephone boat propelled by oars or steam makes only five miles an hour, it will be seen that a ship, instead of lying in a fog, can gain at least a hundred miles a day. The expenses of any of the large passenger steamers are enormous, and the saving on a single day would equip a whole fleet with portable telephone apparatus, Those who have seen the apparatus in operation know that it is practical in the highest degree, and eminently adapted to such a use as we now suggest for it. One need not be very sanguine to look forward to the time when every ship owner will regard a portable telephone as an equipment fully as necessary for his vessel as compasses, telescopes and life-saving apparatus. Although its chief employment at sea may be that above proposed, many other uses will at once suggest themselves to any one familiar with navigation. For instance, a vessel may lie off shore temporarily, taking in cargo or unloading. At such times means of easy and constant communication are a great desideratum. At present the difficulties in the way of frequent intercourse between ship and shore are numerous and often insurmountable. But with a portable telephone apparatus, conversation can be carried on all day long between the two ends, even in the roughest weather and through the night, and much valuable time can be saved. When she arrives at her destination, all that the ship has to do is to send one end of the line ashore. When she leaves, the only thing to be done is to bring that end on board again in any suitable way.

USE OF PORTABLE TELEPHONE APPARATUS AT SEA.

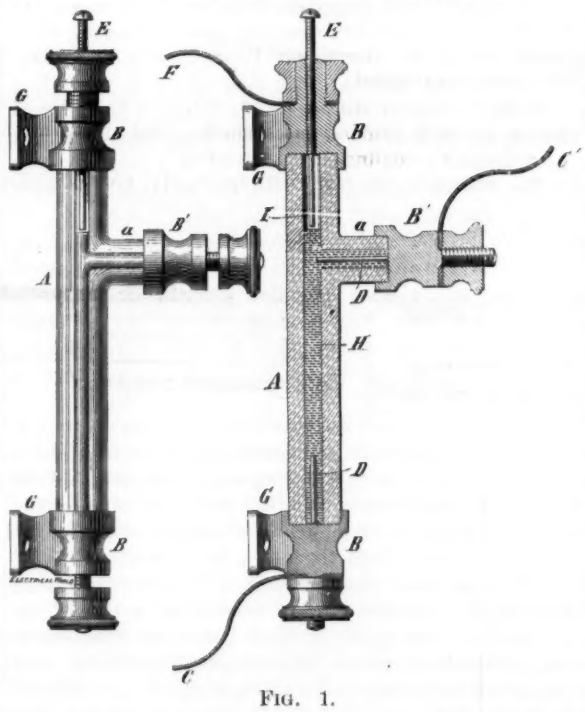

FIG. 1.

Warth's Lightning Arrester.

There have been many forms of lightning arresters devised, based upon various principles and upon ideas good, bad and indifferent. Some provide only for sudden discharges of great potential, others for silent flow of considerable strength. Some are necessarily manipulated, while others are automatic. Some are operated by magnetism and some by expansion from heat, etc., etc.

Those instruments which provide for the safety of other electrical instruments, have been modified for adaptation to protection against the effects upon telegraphic, telephonic and other apparatus of undue connection with operating electric light circuits. The instrument now noticed seems to be better adapted to the latter purpose than to securing protection from lightning.

In Fig. 1 the instrument is given in perspective and sectional views. *A* is a heavy glass tube, with a branch at *a*. Each of the ends of the tube and branch has a metallic cap *B B B'* hermetically sealed upon it. Each one of these caps has a small rod, or wire, of platinum fastened to its base and entered within the tubular cavity of the glass, as at *D D* and *I*. The caps *B B* have bracket-extensions *G G* to them, for attachment to a wall or other support.

Before placing the last cap in position the tube is nearly filled with mercury *H*. The platinum wire *I* is fastened to a screw *E* so as to be adjustable vertically in obvious manner. Normally this wire does not touch the mercury.

This instrument is placed in the circuit within which is the apparatus thus protected; the connections being through the wires *C* and *C'*. The wire *F* is connected to ground.

Whenever an abnormally strong current flows through the circuit, *C, B, D, H, D, C'*, the mercury expands by the heat thus imparted to it, and so rises into contact with the wire *I*. The major part then flows through the circuit from *C*, ending with *F*. So long as the abnormal current flows, the mercury continues in contact with *I*. But when the normal-current strength is restored, the mercury contracts and recedes from such contact.

The wire *I* is adjusted as to height so that rise of temperature from atmospheric influences will not expand the mercury sufficiently to make the protective contact. This instrument can be used for various purposes requiring thermic action for closing an electric circuit, like fire-alarms, etc.

Mr. N. G. Warth is the inventor, and the Standard Electrical Works, of Cincinnati, O., is the manufacturer of this novel instrument.

AMBULANCE EXPERIMENTS.—Some recent experiments at Aldershot, England, with the electric light ambulance, consisted in searching for wounded men on the Redan Hill after a supposed battle; the means employed in the darkness to discover the wounded men being an arc lamp fitted to a tripod and provided with appliances for condensing, spreading, and directing the light. The electrical generating apparatus, including a Gramme dynamo fed by a Brotherhood engine of three horse-power, was all contained in a strong iron carriage on wheels. The engine had cylinders of 80 mm. diameter and was supplied by steam of 90 lb. pressure from a Field boiler, the whole plant weighing, when in working order, about three tons. The lamp had carbons 13 mm. in diameter and was hand regulated, the light being directed by a Mangin reflector and a horizontal dispersive lens. A double cable of about 50 yards of insulated wire served to conduct the current to the lamp and permit of changes of position for the light. The electrical arrangements were carried out by Messrs. Woodhouse and Rawson, and the expense was borne by the National Society for Aid to Sick and Wounded in War. One hundred mock wounded were dispersed over the ground and a column of the Army Hospital Corps moved forward at the same time searching the ground for the fallen men. The results of the experiment appear to have been very satisfactory, the light affording great help to the seachers and surgeons.

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LOCOMOTION BY ELECTRICITY IN NEW YORK.

We called attention last week to the fact that interest has been remarkably reawakened here in the subject of electric tramways and railways, and we mentioned incidentally the scheme for building an underground electric railway along Broadway.

This week we are enabled to lay before our readers drawings and full descriptive details of the Broadway project. One great element of interest in the plan is that it makes a most skillful and ingenious disposition of the hundreds of electric wires which now with their crooked poles disfigure the most notable thoroughfare on this continent; and that, at the same time, effective provision is made against tearing up the pavements. If the article treated only of this point, it would deserve attention in view of the popular prejudice against aerial wires and the recent legislation on the subject.

But the article shows also that when it has become a scientific street, or in becoming such a street, Broadway can be utilized for legitimate passenger traffic. It has long suffered, and is now actually decreasing in importance, from the diversion of travel to streets parallel with it. The slow and clumsy stages rattling and jolting over the rough cobble stones, could never accommodate its frequenters satisfactorily. Horse-car lines with which we are now threatened, can never be anything but an impediment to traffic, while they are much too slow to carry the hundreds of thousands of persons to whom in modern New York, rapid transit between the Battery and the Boulevards has become an absolute necessity. But while horse-car lines along Broadway would be a disgrace to the city, the erection of an elevated railroad would be scarcely short of sacrilege. Broadway, with its natural advantages, ought to be the finest street in the world. But that it cannot be if given up to the horse-car or to the abomination of ugliness called an "elevated road."

All the requirements of rapid transit for Broadway and of burying the wires are met in the proposed scientific street. Some objections may already exist, or will perhaps arise when the work of carrying out the scheme is actively prosecuted. But taken in its entirety the idea is one that recommends itself to us as much for its practicability as for its brilliancy. The underground railway would give additional value to property all over Manhattan Island, would relieve the present avenues of traffic that are now so sadly crowded morning and night, would pay handsomely as an investment, and would preserve Broadway in a renovated condition, picturesque and beautiful, for those grandiose demonstrations of a civil and military character in which, as a people, we take so much pleasure. Run by electricity, after the manner described, the underground road would be very pleasant for travel. Ventilated perfectly, cool, regular, speedy, without noise or dust or smoke, it would compare most favorably with any other kind of locomotion on the surface or on elevated tracks. It would be a road worthy of Dr. Richardson's ideal City of Hygeia.

Evidence as to the ease with which an electric railway can be operated is superabundant. The short line at Brighton, the English watering place, is a well established electric and financial success. The road at Portrush, Ireland, deriving its energy primarily from a waterfall near by, is running with the utmost smoothness. The success of the Vienna and Berlin roads is an old story. Cars have been run by electricity with ease in Paris, and several short lines of electric railways are now projected in various parts of England. Half-a-dozen electric roads have been proposed for London, one of them to pass under the Thames in a tunnel. It looks as though London will soon be covered with a net-work of electric railways, and New York ought not to fall behind in the march of improvement. The Edison, Field and Daft locomotives have been running long enough in this country to convince any candid observer of the feasibility of operating electric railways, and if any doubt still existed on the subject, the recent successful tests of the Bentley-Knight electrical car in Cleveland ought to remove it. It is suggested that the latter series system is admirably adapted to the exigencies of the Broadway underground road, and we have given the details of the proposed adaptation so far as they are now obtainable. Whatever system may be adopted, the general proposition is too good not to succeed on its merits. We believe that all the capital necessary will be forthcoming, and that ere long New Yorkers will be conveyed from one end of the city to the other by electricity at a high rate of speed, with the utmost safety and comfort, Broadway being preserved at the same time for its proper functions, as a main artery of commerce.

EARTHQUAKE SHOCKS.

On Sunday, the 10th inst., the inhabitants of most of the Atlantic seaboard States were treated to an earthquake shock remarkably severe for this part of the country. At two o'clock in the afternoon the thermometer in New York had risen to 68 degrees, according to the Signal Service Bureau, and the barometer had fallen to 30.082 inches. A pretty fresh breeze was blowing from the northeast, but the air was close and oppressive. About seven minutes past two a very sharp shock was felt. It came without warning, lasted about thirty seconds, passed from east to west, and made itself felt over an area embracing New England, New York, New Jersey, Pennsylvania, Delaware, and even remoter regions. The concussion or trembling was similar to that produced by the firing of heavy guns or the passage of heavy wagons. The scare was great, but no lives appear to have been lost, and very little damage was done. The occurrence has been the principal theme of social talk and newspaper comment during the week. As usual, many learned and ingenious theories have been propounded to account for the visitation. None of the reports connect the shock with peculiar electric or magnetic manifestations, and Professor Swift, of the Warner Observatory, Rochester, says that to trace it and the extraordinary electric storms we have had this summer to sun spots, is absurd.

It is held by some that the shock was a confirmation of the hypothesis generally accepted among seismologists, namely, that the earth's crust is rigid and the earth's core is in a molten, liquid state, and that the contraction of the interior by cooling sends a wave of motion through the strata of the crust. Thus the crust is in a condition of perpetual strain, and when portions of it give way earthquakes happen. Science has yet to offer us a theory on these lines that will fit all the facts connected with earthquakes, volcanic eruptions, astronomical conditions and atmospheric phenomena. Better appliances are wanted for the work of investigation than have been used hitherto. These no doubt will be furnished and chiefly with the aid of electricity. At the last meeting of the French Academy of Sciences, we observe, attention was called to the results obtained with a multiplying seismograph. So small is the friction of the parts of this apparatus that a movement of the indicating needle is produced by the heat of the hand. Results were obtained during November and December, 1882, at Puebla, showing that the sun and the moon have a direct influence on the pendulum, the moon attracting it and the sun repelling it. Its delicacy is evidenced by the fact that twenty-two abnormal movements were noted by it in one month, all of which were presumably due to seismic causes, but only one of the shocks was felt in Puebla.

FOUR MILLION WORDS.

The figures are now coming out in regard to the amount of matter handled by the telegraph companies and press agencies during the recent Republican and Democratic conventions at Chicago. We estimated the quantity at about four million words, and were near the mark. The Western Union Company, during the four days of the Republican convention, handled 1,660,178 words of special press matter or an average of 415,000 a day. This was exclusive of Associated Press matter, sent over the Western Union wires. Then, during the four days of the Democratic convention 1,522,900 words were telegraphed for the press, or over 380,000 a day.

The Baltimore and Ohio Company, which made a splendid record, winning the encomiums published by us at the time, is credited with about 70,000 words a day. The other companies taken together are set down for an equal number. During the sitting of the conventions, the United Press handled for the combination of upward of 200 papers served by it more than 100,000 words of bright, vivid description. The Associated Press sent verbatim reports, much fuller than were ever transmitted before, its practice in years gone by having been to send a running sketch, but more of a routine than of a descriptive character. The fullness of the Associated Press reports was duly appreciated. The promptness and the brightness of the United Press reports have been universally commented upon in favorable terms, and their succinctness was probably due in great measure to the efforts of the manager, Mr. Walter P. Phillips, who holds that brevity is the soul of speed as well as of wit.

Our estimate of four million words of "specials" for the telegraphic business of the two conventions is well within bounds. Such a grand total bears remarkable testimony to the dependence of the press upon the wires for its news.

EXHIBITIONS GALORE.

The year 1884 ought certainly to be memorable for the number of its exhibitions. No fewer than nine are to be held between the present time and the end of the year, in the cities of Philadelphia, New Orleans, Cincinnati, Chicago, St. Louis, Boston, Louisville, Milwaukee and Denver. The exhibition at Philadelphia covers the whole realm of electricity. It is a great novelty and is already an assured success, its magnitude far transcending the expectations of its disinterested promoters, the officials of the Franklin Institute. The World's Industrial and Cotton Centennial Exposition at New Orleans promises to be one of the most notable exhibitions ever held in this country. It opens on the first Monday in December, the centennial anniversary of the first exportation of cotton from America. Electrical interests will be prominently represented, and a fine display will be made of the electric light. To light the building with incandescent lamps will require 15,000 lights, and the arc systems will require 700 lamps. It is proposed to illuminate the grounds with five arc lights of 36,000 candle power each. At the Cincinnati Industrial Exposition, to open on Sept. 3, a good show will be made of electrical apparatus. The Southern Exposition, at Louisville, opening to-day, and continuing until Oct. 25, is to be on an even more extensive scale than its predecessor of last year. The main building and the art gallery will be lighted by 4,700 Edison lamps of 16 candle-power each. The St. Louis Exposition is to be lighted throughout by electricity, and the same is true of the Milwaukee Industrial Exposition.

Besides these, Boston has its fourth annual exhibition of the New England Manufacturers and Mechanics Institute; Chicago has an Inter-State Industrial Exposition, and Denver a National Mining and Industrial Exposition.

It is a little difficult to repress the doubt that some of these numerous shows will interfere injuriously with the others. Yet taking a broad view of them, it must be admitted that their object is good and that they act as a stimulus to industrial development and well-directed invention. Nearly every one of them has a distinct set of exhibits to place before the public, and the eagerness with which space has been sought shows that they are considered good mediums for reaching the people of the country. A very large attendance is expected at each, and the local populations can easily supply this, to say nothing of the visitors who may be attracted from the surrounding country and distant States.

A GOOD INVESTMENT STOCK.

It is with much pleasure that we direct attention to the report of the action taken at the regular monthly meeting in Boston on August 12 of the directors of the American Electric and Illuminating Company. The resolutions adopted declaring large dividends on the preferred and common stock, and making provision for a reserve fund, tell a remarkable story of continued and growing prosperity. The American light is being carried vigorously into new territory, as our news columns testify, and it is within our own observation that the lights recently put up in Brooklyn have given a great deal of satisfaction, and have caused the streets of that big suburb of New York to be better lighted than they have ever been before. There is no doubt that, even should the depression in financial and commercial circles be prolonged, the electric lighting business has seen its worst days, and is now entering upon a period of rapid growth and large profits. We note that even in England the tide is on the turn.

MANY AN ANCIENT VOLUME.

At the Paris Electrical Exhibition, in 1881, Mr. Latimer Clark, of London, had on exhibition about 75 volumes, interesting and very rare, bearing upon magnetism and electricity. There were a work by Vincentius, Bishop of Beauvais, who wrote about 650 years ago, in which the earliest printed allusion is made to the polarity of the magnetized needle; "Magiæ Naturalis," printed in 1558, containing the first allusion to telegraphy by the magnetic needle; "De Magnete," a work by Dr. Gilbert, physician to Queen Elizabeth, and a number of old works

referring to the wonderful sympathetic telegraph first mentioned by Baptista Porta in 1558. We have seen nothing to lead us to believe that Mr. Clark's valuable collection will be exhibited at Philadelphia, and, if not, it might be well for one of the committees to take steps to procure for the Memorial Library such copies of these old works as may be accessible here.

FRANKLIN'S GRAVE.

The pilgrimage made by Mr. Joseph Christie to the grave of Benjamin Franklin, described in this issue in so appropriately modest a manner, will be a sufficient hint to many of the noted persons visiting Philadelphia next month to go and do likewise, and if each one who has been benefited by the writings and genius of that Great Citizen of the World will drop a single flower on his grave he will sleep for once "beneath a wilderness of flowers."

Words can add little to the honors showered upon his memory, and the humble disciple standing by the hallowed spot can only contemplate with Byron :

> "While Franklin's quiet memory climbs to heaven,
> Calming the lightning which he thence hath riven,
> Or drawing from the no less kindred earth,
> Freedom and peace to that which boasts his birth."

The picture that we give of Franklin's grave, with Mr. Christie's letter, may not be the most artistic, but it is the oldest obtainable for the purpose and therefore has some historical interest of its own.

Telephone Poles in the Streets.

The Metropolitan Telephone & Telegraph Company brought a suit in the Superior Court against the Colwell Lead Company, and obtained a temporary injunction restraining the defendant from interfering with or attempting to remove poles of the telephone company in Thirty-ninth street, west of Sixth avenue. These poles project into the excavation for vaults which are to be constructed by the defendant company. A motion to continue the injunction during the pendency of the action was heard by Judge Ingraham, who has rendered a decision denying the motion. In his opinion the Judge says : "The power of the Legislature over the streets is not unlimited. It is to govern and regulate such use or interest in the land as vested in the corporation under the provision of the law for the taking of the property. The city took the property in trust to appropriate it as a public street, and so far as it held it for a public street it was subject to the control of the Legislature. That the power of the Legislature over the streets is limited, and that the Legislature had no authority to authorize a structure in a street that is inconsistent with such street use, was held in the Story case. I think that the power of the Legislature to regulate the streets is confined to the use for which they are taken, viz., to be appropriated and kept open as public streets. The plaintiff owns and operates a telephone line in Thirty-ninth street and uses poles to conduct the wires used in such business, and I am clearly of the opinion that such a use of the streets is not a street use and does not come within the terms of the trust upon which the city holds the fee of the streets, and so far as the rights of abutting owners are involved the Legislature had no power to authorize the plaintiffs to use the streets for such purposes. I am of the opinion that the plaintiffs have failed to make out a case which would justify me in granting the injunction prayed for, and the motion must be denied and the temporary injunction dissolved."

The American Company's Progress.

At the regular monthly meeting of the directors of the American Electric & Illuminating Company held on Tuesday, August 12, 1884, the following resolutions were unanimously adopted :

Whereas, The earnings of the company for the past six months fully warrant the declaring of the regular semi-annual dividend of 4 per cent. on the preferred stock, and an extra semi-annual dividend of 3 per cent. on the preferred and common stock, and

Whereas, The greatly extended business of the company in covering its newly acquired territory necessitating the continued use of more capital makes it expedient and prudent to give due consideration to conservative business methods and to make judicious provision for future contingencies in a substantial reserve fund therefore, be it;

Resolved, That the following dividends be declared and made payable at the company's office, 197 Congress street, on Monday, Sept. 1, 1884, viz.: Four per cent. on the preferred stock, two per cent. extra on the preferred stock, two per cent. extra on the common stock.

Resolved, That an amount equal to one per cent. on the entire capital stock of the company be taken from the accrued profits and carried to a reserve fund.

Resolved, That until the reserve fund now created reaches an amount equal to fifty per cent. of the cash capital of the company, dividends shall not be paid in excess of the amount this day declared.

Resolved, That the transfer-books be closed from Aug. 20 to Sept. 1, 1884, both days inclusive.

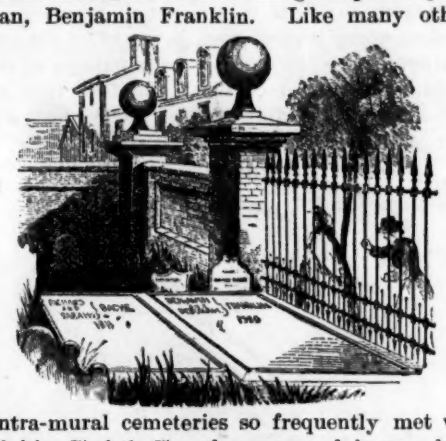
ST. JOHN, N. B.—Mayor Grant has contracted with the St. John Electric Light Company to place a pole light, 68 feet high, on King square.

Philadelphia and the Exhibition.

III.

The Grave of Franklin.

About half a mile westward from the Delaware River, at Fifth and Arch streets, in the busiest part of Philadelphia, lie the mortal remains of that great philosopher and statesman, Benjamin Franklin. Like many others of



those intra-mural cemeteries so frequently met with in Philadelphia, Christ's Church graveyard is now hemmed in on every side by factories and stores. It is surrounded by a high brick wall, fast decaying from the storms of nearly two centuries ; and were it not that a breach, probably ten feet wide, was torn out in 1858 and an iron railing substituted near Franklin's grave, the casual passer-by would not know that he was in the neighborhood of a cemetery.

Upon entering the yard the visitor finds himself in groves of elm and chestnut trees, with tombs on every side of him. There is little sign of care-taking. Some of the tombstones are broken; from others, still standing, the inscriptions have been worn away by the elements, while others have fallen and lie covered with moss and hidden in the underbrush. But the visitor has left behind him the noise and bustle of the street, and he is soon beside the grave of the immortal "Poor Richard."

This interesting spot is at the corner of the yard, as shown in the engraving, where Fifth intersects Arch street. The grave is covered by a slab lying on the turf, and bearing the simple inscription:

Benjamin and Deborah, } Franklin, 1790.

A stately elm tree, not shown in the engraving, springs directly from the foot of the tombstone, so closely that its roots must by this time have extended through the grave, and spreads its branches over the neighboring street. A broken flower-pot with a faded flower rests on the slab, and all else is left to the imagination of the pilgrim.

At the head of the grave are two small upright stones, one to the memory of John Read, the father of Mrs. Franklin, and the other to "Francis F., son of Benjamin and Deborah Franklin, deceased Nov. 21, 1786, aged 4 years, 1 month and 4 days." Next to the Franklin grave, to the southward, is a similar stone, inscribed simply:

Richard and Sarah } Bache, 1811.

the daughter and son-in-law of Franklin. Some years ago, in excavating a part of the yard, a tombstone was discovered which bore the name of Dennis Franklin, a child of the great philosopher, who died at an early age.

It first occurs to the pilgrim that this perfect model of a hard-headed, intensely practical American should have a monument more expressive of his grand political, literary and scientific record ; but a little reflection shows that the plain stone and that quiet nook under the elm reflects the character of Franklin better than could a glowing epitaph. It was his wish, expressed in his will, to be buried "with as little expense or ceremony as may be," by the side of his wife, who was buried here Dec. 22, 1774 ; that "a marble stone, to be made by Chambers, six feet long, four feet wide, with only a small molding round the upper edge, and this inscription :

Benjamin and Deborah } Franklin, 178–,

be placed over us both."

It will thus be seen that he fully expected to die in the decade between 1780 and 1790, yet he survived the companion of his joys and troubles sixteen years, and did not join her in their silent resting-place until April 18, 1790.

It may be worth while also to refer, as a contrast, to the epitaph which Franklin wrote for himself in 1728, when he was but 23 years of age :

The Body
of
BENJAMIN FRANKLIN,
Printer,
(Like the cover of an old book,
Its contents torn out
And stript of its lettering and gilding,)
Lies here, food for worms,
But the work shall not be lost,
For it will (as he believed) appear once more
In a new and more elegant edition,
Revised and corrected
by
THE AUTHOR.

But his later life has taught us that imperishable fame does not rest upon the successful manœuvres of a victorious army, and that Peace hath her victories no less than War. Muffled bells were tolled and minute guns boomed, while twenty thousand people followed this plain man to this grave. The nation's—the world's—sorrow was best exemplified by the great Mirabeau, who, in announcing the death of Franklin to the French Assembly, spoke of him as "the Sage whom two worlds claim ; the man whom the history of Empires and the history of Science alike contend for."

Out once more into the great forest of red brick and mortar, and the hurrying throng and the rumbling wagons loaded with merchandise soon bring the dreamy pilgrim back from Franklin to Morse; and a visit to the church where Franklin worshiped, and the pew where he sat, is a fitting close to the pilgrimage to his grave.

Christ Church (Episcopal) is a full half-mile eastward from the churchyard. The journey thither, if made *via* Market street, takes us by the locality where Franklin lived, on Market street, between Third and Fourth streets. The dwelling house in which he died was torn down in 1812, but the carriage-way that led up to the house still remains as "Franklin Court."

Christ Church, on the west side of Second street above Market street, is one of the oldest churches in the city. There is an older church (Gloria Dei, or "Old Swede") farther down town, which has stood there for 190 years, but its associations are not as interesting as those of Christ Church. In the latter church the remains of the famous Bishop White are laid in the chancel, while the little graveyard attached to the church contains the remains of Robert Morris, the great financier of the Revolution, and also the remains of many other notable men. Congress has sat here in a body, and Washington and Franklin both had their family pews here. After the death, in 1699, of the first rector, "of a contagious distemper caught in visiting the sick" (yellow fever), the Bishop of London sent over Rev. Evan Evans from England, and the new minister was approved by William Penn as appearing to be "a man sober and of a mild disposition."

Christ Church contains many relics of English rule, including a bust of George III., now hanging in the vestry, but which was torn down by the mob at the breaking out of the Revolution. The chandelier now hanging in the centre aisle was bought in London, and brought here in 1744, for £56, and the pulpit still in use has been here 114 years.

It is not my intention to give a description of the church, but merely to mention a few interesting facts about the sacred place so closely associated with the memory of Franklin, to the end that the visitor may not omit this point in so large a city as Philadelphia.

In the centre aisle, the pew now numbered 56 and 58 (a double pew) was the one occupied by Gen. George Washington and family, and was then known as "the President's pew." The pew now numbered 70, lower down in the same aisle, was that occupied by Benjamin Franklin, who was a Vestryman for many years.

When, after our Declaration of Independence, the steeple of this church was struck by lightning and the crown mounted thereon completely melted, we can hardly suspect Franklin, the Scientist, and his kite ; but the hand of Franklin, the Patriot, and the unwavering sternness of the Revolutionary Fathers, are plain in the records of the church, which tell us that in 1776 the Vestrymen formally requested the Rector, "for the peace and well-being of the church," to omit those petitions in the Litany wherein the King of Great Britain is prayed for. J. C.

PHILADELPHIA, August 11, 1884.

More Telephone Litigation.

The Clay Commercial Telephone Company, now in active operation in Philadelphia, during the early part of this year became defendant in a suit brought by the American Bell Telephone Company, the issue of which will test the validity of the Bell patents. The Bell Company, under a bill in equity filed in the United States Circuit Court, asked for an injunction to restrain the Clay Commercial from operating their present telephones, which, it was alleged, were constructed in such a manner as to be an infringement of the Bell patents of March, 1876, and January 1877. On Saturday last, the 9th inst., counsel for the Clay Company filed in the office of the Circuit Court a voluminous answer to the bill of complaint. The answer is an interesting document, and, besides covering the whole history of the development and perfection of the telephone, contains matters that have never been brought before the court in any of the numerous suits now pending. The paper starts out with a general denial that Alexander Graham Bell was the first inventor of the telephone, and alleges that James W. McDonough in April, 1876, had filed an application for a patent embracing the invention claimed by Bell.

The answer then gives the facts of the controversy which occurred in 1876, and declares that the examiner to whom the question was referred declared McDoncugh was entitled to priority of invention; "and inasmuch," says the answer, "as said decision of the said Patent Office is still subsisting in full force and effect, it is in law, as the respondent is advised, to be deemed and taken, by the adjudication of the tribunal in such case made and provided,

that the fundamental principle and the substantial devices of the said patents of the said Bell were anticipated by the said McDonough, who, and not the said Bell, is the first and original inventor or discoverer thereof, and is the person who is legally entitled to receive the letters patent therefor."

The respondent declares that McDonough received three letters patent, containing claims which embrace substantial and material parts of the things patented by Bell. Reference is then made to the suit now pending in the Circuit Court for the District of Connecticut, with the claim made by the successors of Bell of having purchased McDonough's right for $300,000. On this point the answer says:

"But the respondent, upon information and belief, saith that the sum offered or agreed to be paid, or secured by the successors of the said Bell under the said alleged agreement of acquisition, was about the sum of three hundred thousand dollars, and that this sum was offered or agreed to be paid, not, as pretended, for the purpose of avoiding litigation, but really from a consciousness, knowledge and belief that the claims of the patents of the said Bell were invalid for want of originality, and that, in order to save said patents, it was a matter of necessity to buy off the real inventor, even at the cost, fully or approximately, of the very large sum of three hundred thousand dollars."

The answer then goes on to deny that electric speaking telephones, had never been in use before Bell obtained his patents, but, on the contrary, asserts that they had been in use, and were constructed by James W. McDonough, Daniel Drawbaugh, Elisha Gray, Thomas A. Edison and ten other persons, many of whom had obtained letters patent for their discovery prior to the Bell patents, and for this, among other reasons, the Bell patents are null and void. Some twenty-seven patents are mentioned as antedating Bell's. The Bell patents are again attacked for want of novelty, for the reason that the material and substantial parts of the invention claimed had been made known and described in various scientific journals and magazines for a considerable time prior to the issuance of the patents. The answer contains a long list of such publications made in this country and abroad.

In conclusion, the Clay Commercial submit that the complainants are not entitled to any relief by way of injunction, profits, damages or costs, and that the bill of complaint is unfounded and unjust, and should, therefore, be dismissed.

Good News for the Deaf.

Leo Ehrlich, former Secretary of the Humane Society, has invented a device, says the St. Louis *Republican*, which will cause all the deaf people in the land to call him blessed. It consists of a contrivance which can be located in the handle of a cane, umbrella, parasol, or fan, and which, when placed to the ear of a deaf person, will cause him or her to hear any sound audible to the ear of a person who is not afflicted with deafness. The device which produces these effects is a tube about six inches long placed in the hollow of a Malacca cane. In the tube is a cone-shaped electric coil beginning at a small battery at the lower end of the tube and terminating in the bird's bill. The vibration of this coil causes a multiplication of any sound or noise passing into the tube through several slits in the side of the cane. The cane and tube together weigh about six ounces, and the whole outfit looked like an ordinary Malacca walking-stick with a silver head.

"How did I happen to invent it?" said Mr. Ehrlich, in reply to a question. "Well, it was the necessity of my own case. I was so deaf that it interfered with my social and business duties. I have been treated for my ailment in Paris, Vienna, and in this country, and still I grew worse; so I set about to invent something to cure me, and the result surprised me. I can now hear as well as you can without the use of the cane. It is very simple. It is simply a multiplication of sound by electricity and the projection of a steady current of electricity against the weakened or paralyzed nerves and tissues of the ear. There is no degree of deafness in which a man cannot hear with this, even if the ear drum is destroyed. Of course it wont make a new ear drum, but it will make him hear. It is simply a multiplication table in the shape of sound. Here is one of the features of it. When a man is near-sighted he can get a pair of glasses, and no one takes any notice of it; but when a man is deaf he must either lug an ear-trumpet around with him, much to the amusement of everybody, or hear nothing. This thing he carries in a cane or umbrella, and not only uses it without any one suspecting what it is, but hears well and is cured of his deafness. It accomplishes what nothing else has ever done. E. C. Witherspoon of the Cotton Exchange, who has not heard a dog bark for the past twenty-three years, can hear as well as anybody now. He was made deaf by the accidental discharge of a piece of artillery. His friends on 'Change are astonished at the readiness with which he hears now. I have been at work at this over a year, and when I began everybody had to yell close to my ear; now I can hear the slightest whisper at a talking distance. I will send one to Mr. Edison, who is deaf."

Not a Good Year.—Mr. Thomas A. Edison took out only sixty five patents during the year 1883. This is official from the annual report of the Commissioner of Patents. It could not have been a good year for inventions.—*Commercial Advertiser.*

Wooden Pulleys.

Years ago, before the time of railways west of the Missouri River, we were engaged in extracting gold by machinery from rocks and ores in the Rocky Mountains in Colorado. There was but one foundry in the country, and iron castings cost thirty cents per pound. Freight made machinery from the East cost as much or more. From motives of economy in first cost, it was often the practice for the carpenter or millwright to make pulleys of all sizes from wood. We soon recognized the fact that a well-constructed wooden pulley exerted a higher tractive power on the belt than did a like-sized iron one. But,

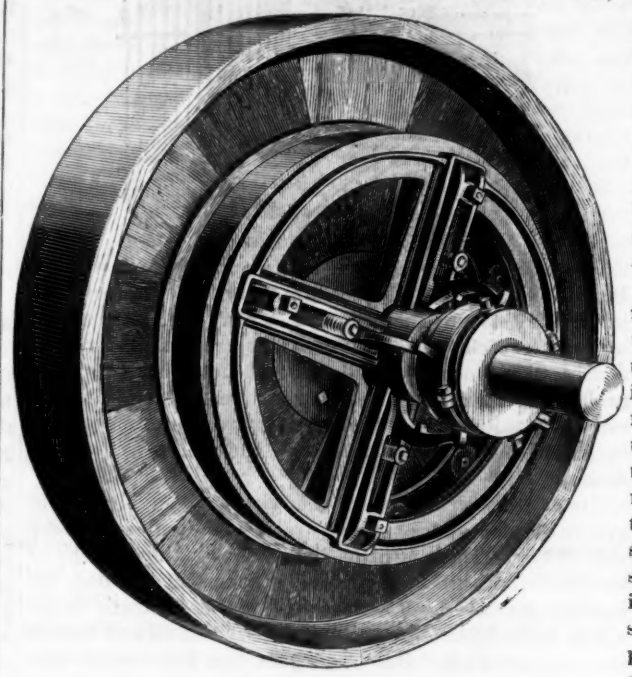


Fig. 1.

owing to lack of skill and facilities, such pulleys were not lasting in shape and stability, so iron ones were preferred whenever they could be procured.

Those pulleys were made in two ways. One kind had one or two disc-flanges key-seated to the shaft, and wooden radial arms bolted to the flanges by bolts parallel with the shaft. The flange, or rim, of the pulley was built up of superimposed layers of wooden segments nailed or screwed together so as to break joints. By means of a rest, large hand-turning tools, and the rotation of the shaft, the rim of the pulley was turned to shape and smoothness. Another kind had a cast-iron spider, like the hub and arms of an ordinary iron pulley without the rim, with wooden segments bolted to the spider and together, and turned up as in the other case.

Our experience with these crude, make-shift wooden pulleys makes us believe in the utility of well-made ones, having appliances and a preparation which insures their preservation from the action of the atmosphere in its varying changes of temperature and moisture. Therefore we are pleased to present to our readers illustrations and

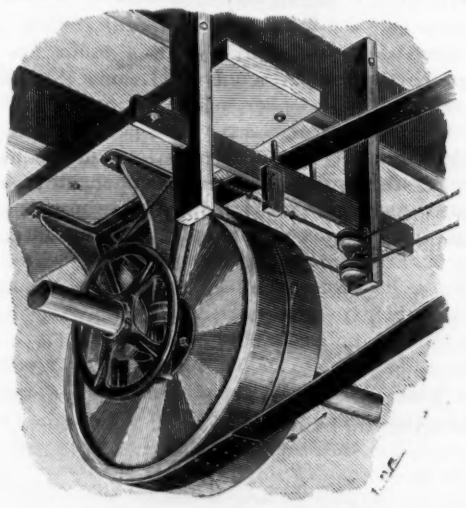


Fig. 2.

descriptions of such pulleys made on honor and for sale to those who may need a superior and useful article.

The Taper-Sleeve Pulley Works, of Erie, Pa., make a specialty of the manufacture of wooden pulleys of approved construction and fittings for securing them to the shaft, as well as adapting them to the varying requirements of users. Fig. 1 illustrates one of their specialties, called the Friction Clutch Pulley. A spider having iron arms is fastened to the shaft. Wooden blocks are inserted in the ends of the spider arms, and have their faces at right angles to the shaft. A wooden pulley, made with its web of wooden sectors having the grain nearly radial, is placed loosely on the shaft next to the spider, and gripping jaws are pivoted to the spider near the hub. Bolts passing through the spider are attached to compound levers which are operated by a coned-hub with band and lever as in some other clutch-pulleys. The jaws have wooden faces also. A re-entrant flange fastened to the pulley runs between the faces on the jaws and spider when they are not compressed. Movement of the lever and its compound attachments insures the frictional contact of the spider and jaw faces with the two faces of the re-entrant flange. Space does not allow us to illustrate the details of construction.

Fig. 2 illustrates another of their specialties. It is called the Dead Pulley, and is intended to be a superior substitute for the usual tight-and-loose pulley.

Instead of the ordinary method of placing a wide-face pulley at the line shaft, across the face of which the belt is made to shift when passing from fast to loose pulley, and *vice versa* on the countershaft, two pulleys of one-half the width are substituted. One of these pulleys is secured to the shaft, and the other, or Dead-Pulley proper, is suspended by its side, about a quarter of an inch intervening between the edges of the pulleys, and so suspended as, without contact, to encircle the shaft with its long sleeve hub. This hub revolves freely in a box or journal sustained by an independent hanger. Thus suspended, the Dead-Pulley is, in fact, an independent loose pulley, and it will readily be seen, when the belt is shifted to its surface, and that of the loose pulley opposite, on the counter-shaft, both pulleys must come to rest, and with them the belt; and that the line shaft will be entirely relieved from the *strain* of the belt.

In the figure the belt is shown on both loose pulleys. When the belt is on the loose pulleys and at rest, in order to shift the belt to the fast pulleys it will be found necessary to have the belt in motion: To this end the edge of the Dead-Pulley is pressed against the edge of the fast-pulley until sufficient friction is attained to set the Dead-Pulley in motion, together with the belt and opposite loose pulley; the operation of shifting the belt can then be readily completed. The manufacturers claim that their wooden pulleys are better than other wooden pulleys, because they use only carefully selected, kiln-dried stuff; that the web is constructed in several sectoral pieces, all placed with the grain of the wood in radial lines; that they are turned over their entire surfaces in specially-constructed lathes, therefore are in perfect balance; that the parts are practically interchangeable; that their specially prepared, filled surface is better than any other, and that it is the lighest and strongest pulley made, as well as waterproof, and the best holder of the belt. In support of this last statement they cite and tabulate the statements of Morin and Haswell.

Portion of circumference embraced by belt.	Relative value of leather belt.	
	On wooden pulleys.	On iron pulleys.
.20	1.80	1.42
.30	2.43	1.69
.40	3.26	2.02
.50	4.38	2.41
.60	5.88	2.87
.70	7.90	3.43

Morin.—Appleton's Encyclopedia of Mechanical Arts.

Portion of circumference embraced by belt.	Relative value of leather belt.	
	On wooden pulleys.	On iron pulleys.
.20	1.80	1.40
.30	2.40	1.70
.40	3.30	2.00
.50	4.40	2.40
.60	5.90	2.90
.70	7.90	3.40

Haswell. — Engineers and Mechanics' Pocket Book.

Haswell summarizes thus: The ratio of friction to pressure for leather belts, when worn over wooden pulleys, is .47; over cast-iron pulleys, .24.

The hubs of their other wooden pulleys are made each with a patent taper-sleeve and nut by which the sleeve is drawn into the hub and thus compressed around the shaft and within the hub. This device obviates the necessity of set-screws, or keys, and relieves the shaft from mutilation though securely fastening the pulley. A coupling of like construction is also made by them.

In the description of the Brush Electric Light Co.'s plant at Rochester, N. Y., in the issue of The Electrical World of March 22, 1883, the use there of some of these devices was mentioned.

Exhibition Notes.

The United States Electrical Commission, which met in Philadelphia on Thursday, August 7th, continued its session on the following day.

Mutual courtesies of a pleasant character were exchanged between the Commission and William P. Tatham, President of the Institute, and Col. Charles H. Banes, Director-General of the Exhibition. Of the members, Professors Rowland, Snyder, Gibbs, Barker, Young, Houston, Van Dyke and Wahl were present. The entire day was consumed in preparing a list of the conferees, which work was not completed at the time of adjournment. It was definitely settled that the National Conference of Electricians should be held under the direction of the Commission, in the large lecture room of the International Exhibition, on September 8th, at eleven A. M. It was also decided to issue a circular inviting the conferees to submit a paper, to be read before the conference, and to invite all prominent foreign electricians who are expected to be in Philadelphia, to be present.

The invitations to the Conference will be confined to physicists of eminence and to experts in the practical management of electrical appliances and apparatus. It is proposed to extend special invitations to prominent foreign visiting electricians.

It is not definitely known what subjects will be discussed at the Conference, but the following matters have

been suggested: The sources of electrical energy; the theoretical conditions necessary to the most efficient construction of the dynamo-electric machine for the various purposes of practical work; the electrical transmission of energy; the system of arc and incandescent lighting; the theory of the electric arc, storage batteries, electro-metallurgy; lighthouses for the coast; applications of electricity to military and mining engineering; lightning protection; induction in telephone lines, and the problem of long-distance telephoning; the question of underground wires; atmospheric electricity; earth currents and terrestrial magnetism; photometry and standards for photometric measurements, the ratio of the electro-magnetic to the electro-static systems of units and the electro-magnetic theory of light; and, finally, on account of the pressing necessity for accurate and uniform electrical measurements, it is probable that the question of establishing a National Bureau of Physical Standards will receive proper attention.

At the Exhibition buildings Professor Marks, the Superintendent of the Exhibition, and Assistant Superintendent Carl Herring have been engaged for several days past in perfecting the twelve jets for the fountain which is to play in the centre of the Exhibition Building, and displaying water illuminated and tinted with all the colors of the rainbow. Each jet will throw from the circumference of the basin a column of water, which will gracefully curve over and fall upon a pyramid of rocks in the centre of the basin. It has been a nice and delicate piece of work to keep these columns of water from separating into spray. It was found that the water took a rotary motion on leaving the nozzle, and thus broke into a spray, a thing which was fatal to its proper illumination with the colored lights, but by a series of tubes this rotary motion was checked, and a trial yesterday resulted in shooting into the air a perfect cylinder of water about an inch in diameter, which retained its form along its curved path until it dropped upon the stones in the centre. At the base of each jet will be a McTighe arc electric light, the rays of which, passing through colored glass, will be sent into the water at the base and will be there retained by internal reflection until it breaks into spray at the centre. Other jets will issue from the top of the central pyramid, and these will be illuminated by the reflection from electric lamps placed along the arches of the building.

Charles Bullock, Chairman of the Committee on Space, has set apart an airy room at the northwest corner of the building for the accommodation of the members of the press. The Edison Company will light the room with incandescent electric lamps, and John Wanamaker has agreed to furnish it.

Many carpenters are at work about the building dividing off the spaces for the exhibits, and the Porter-Allen high-speed engine from the Southwark Foundry is being set and adjusted.

Among other features of great interest will be fac-simile electrotypes of the ancient coins and medals contained in the British Museum. It is the only collection ever seen in this country, and it is said that, as a general rule, only electrotypes of the rare coins and medals are seen at the British Museum, the originals being shown only on special occasions. These electrotypes have been presented to the American Numismatic and Archæological Society of New York, who send them to the Electrical Exhibition.

The electrotypes to be exhibited are taken from the finest ancient coins in the national collection of the British Museum, arranged in seven cases in such a manner as to afford a synoptical view at once historical and geographical of the gold and silver coinage of the ancient world, from the invention of the art of coining, about B. C. 700, down to the Christian era.

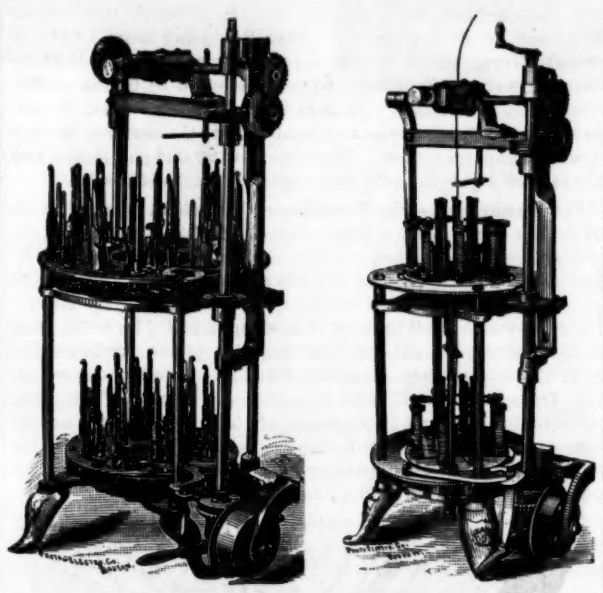
The United States Electrical Commission was in session on the 13th at the Franklin Institute, with President Rowland in the chair. The members present were: Professors Barker, Brackett, Snyder, Gibbs, Houston, Newcomb, Vandyck, Wall and Young. The Commission assembled in the morning and were in conference until late in the afternoon. The appointment of conferees was considered and a list of between one and two hundred was prepared. It was also decided to request foreign gentlemen, distinguished in the study of electricity, to take part in the conference, and between thirty and fifty will be invited. The meeting of the National Conference will be held in the lecture-room of the Electrical Exhibition building on Sept. 8th at three o'clock. J. C.

PHILADELPHIA, Aug. 14, 1884.

Braiding Machinery for Insulation.

If all the industries allied to the practical developments of electricity were enumerated, the list would to-day be a very long one, although a few years ago it would have been too insignificant to be worthy of compilation. Every new electrical invention and application gives an impetus to some new department of industry or trade. Electric lighting, one of the latest outgrowths, has, for example, been the means of benefiting a great many branches of mechanics, and its effect on the production of high speed engines has been notable. Another and very dissimilar industry to which it has given great stimulus has been the manufacture of insulated wire and of braiding machinery. At the present time, the demand for wire whose insulation secures the greatest conductivity and safety is largely on the increase, and, naturally, the demand for good braiding machinery increases with every step.

We illustrate herewith three of the braiders manufactured by the Rhode Island Braiding Machine Company, of Providence, R. I. These machines are to be found in the factories of such well-known concerns as the Ansonia Brass and Copper Company, the Electrical Supply Company, the American Electrical Works, Providence, R. I., the Clark Insulated Electrical Wire Company. Fig. 1



FIGS. 1 AND 2.

shows a double braider, by which the braid is put upon the wire in two thicknesses, one upon the other. Fig. 2 represents a double winding machine, which puts upon the wire two covers wound in opposite directions. Fig. 3

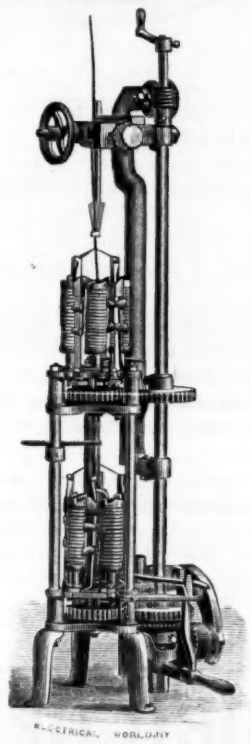


FIG. 3.

represents one of the latest machines brought out by the company. It is used for covering annunciator wire, laying four strands in two opposite directions. The machine is simple in its parts, is easily kept in order, and is a rapid worker.

The styles made by the company vary, of course, in weight and capacity, answering the work to be performed by them. An important part of the business now includes all the supplies necessary in the business of braiding and winding. Those of us who remember the early day of insulated wire, can hardly realize that the business has been brought to its present perfection of detail in manufacture and supply.

DEPARTMENT OF INQUIRIES.

While we are pleased to answer in this department all questions of general interest to our readers, and do so without charge for time or expense, we must request those of our patrons who desire information for their personal interest, and who cannot be properly answered in this way to send us with their request a small sum, say from $1 to $5, to pay for the time and the expense incurred for their exclusive benefit.

NO. 90—SPARK COIL.

"What size spark-coil shall I use for lighting four gas-burners?" J. V.

EASTON, Pa.

Mr. Chas. S. Pinkham, of the Pinkham Electric Gas Lighting Co., furnishes us with the following particulars: "Straighten about two pounds of No. 18 soft Norway iron wire, and cut it into lengths about eight or ten inches long, preferably the latter. Bind the bundle at both ends with suitable heads. Wrap this core with about four pounds of No. 14 Phillips' patent cotton-covered magnet wire, using care to keep a perfect insulation between the different convolutions. One or two cells of battery will do satisfactory work with this coil."

NO. 91.—TELEPHONE PROTECTION.

"I inclose clipping from the *Norwood News*:

"'C. A. Martin, manufacturer of the Commercial Telephone, has just closed a contract with an electrical supply company of New York to furnish 500 magneto call bells to be used on his improved telephone lines. Mr. Martin informs us that owing to there being no electric batteries used in connection with the Commercial Telephone, the danger from lightning that the electric bell and other telephone is subject to, is avoided.'

"Will you kindly inform an attentive reader of your excellent journal why danger from lightning is avoided by omission of battery from telephone lines?" G. B. S.

OGDENSBURG, N. Y.

This seems to us to be one of the loosely asserted "advantages" or "virtues" of many of the schemes of the day, and made by persons uninformed, or untruthful. The simple omission of batteries from telephone lines is not in any sense a protection for the line or its instruments from damage by lightning.

THE TELEGRAPH.

REDUCED TELEGRAPH RATES.—The united telegraph lines have announced some sweeping cut rates. The charge for all words over ten will now be one cent instead of two. On night messages the rates will be fifteen cents for fifteen words, and one cent per word over. Over 1,800 offices are now controlled by this combination.

MILKING TELEGRAMS. — Postmaster-General Fawcett has introduced into the British Parliament a bill making penal the "milking" of press or other telegrams by telegraph or cable companies to whom they are intrusted for transmission. The bill meets with general favor, and is set down for unopposed passage this session.

OIL EXCHANGES.—A new rule has been adopted at a meeting of the New York Petroleum Exchange, providing that all exchanges in the "Conference" shall not connect by telegraph or telephone with any oil exchange not a member of the Conference. If two-thirds of the other exchanges adopt this resolution, it becomes law.

MARTHA'S VINEYARD.—The residents of Martha's Vineyard will soon have telegraphic communication with the mainland by means of a new cable to be laid by the Western Union Company. The old cable broke last fall. The steamer William Orton left New York for the Vineyard last week, and has ere this completed her work. The want of proper telegraphic facilities was sorely felt at the time of the loss of the City of Columbus.

BOSTON ITEMS.—Mowray S. Smith has been appointed Superintendent of the Eastern district of the combination of the Bankers & Merchants, Baltimore & Ohio and Postal telegraph companies. His headquarters will be in Boston. Edwin F. Leighton, an alderman of the Hub, is to be the manager of the Boston office, and Wm. Sheehan of Providence is to have the management of the Newport office. A new district service is to be established in Boston by the triple combination against the Western Union.

RECOVERING DAMAGES FOR A MISTAKE.—A dispatch of August 2 from Petersburg, Va., says: The Hustings Court of this city, Judge E. M. Mann presiding, has been engaged for the past three days in the trial of the suit of Arrington & Sons against the Western Union Telegraph Company, to recover $720, which amount the plaintiff claimed to have lost in the sale of a large lot of tobacco through a mistake of the company in transmitting a message. An offer of sale was made at 13⅛ cents per pound, but when the message reached the purchaser it read 13 cents. The jury last evening gave a verdict in favor of the plaintiff for the full amount. An appeal will be taken.

TELEGRAPHS IN TEXAS.—The Baltimore & Ohio Telegraph Company, under the provisions of their contract with the Gulf, Colorado & Santa Fé Railway Company for the extension of the Baltimore & Ohio Telegraph system in Texas, filed a petition in Houston, Tex., August 5, with the County Court, praying for the expropriation, under the laws of the State of Texas, of a right of way over the Texas & New Orleans Railway between Houston and Orange in Harris County, Texas, for the construction of the Baltimore & Ohio Telegraph line. The Western Union Company were made parties defendant with the railway company. The court granted the petition on the 14th. Similar petitions have been filed in other counties in Texas.

PAPER INSULATORS.—A not inconsiderable item of expense to the telegraph companies is the breakage of the common green glass insulators at present in universal use. Noticing a charge of $86,000 on this account on the books of a district superintendent of the Western Union in Indiana, a Cleveland gentleman was set to thinking and has since perfected a machine for making insulators of paper, with a capacity of turning out 6,000 a day. After being pressed to the desired shape, the insulators are treated to a coat of tar, asbestos, etc. Of course they are unbreakable. We understand that the telegraph companies are eager to get hold of the new invention, and that the company at present supplying the glass insulators has offered a large sum for the patent.—*Iron Trade Review.*

THE TELEPHONE.

MR. STORROW, of Boston, the principal counsel in the Bell-Drawbaugh telephone suit, is now lying dangerously ill from nervous prostration. Overwork in the case is said to be the cause.

OBITUARY NOTE.—Mr. J. Albert Bodwell, of Cambridgeport, Mass., connected with the Mexican Tel. Co., died in the City of Mexico, June 6th, 1884, of small-pox. He had just recovered from an attack of yellow fever when he contracted the disease which caused his death. Mr. Bodwell was taken sick on the day previous to his proposed starting for home. He leaves a widow and a little daughter to mourn his loss, as well as many friends in the telephone business.

A FINE SUBMARINE TELEPHONE CABLE.—The Sunset Telephone & Telegraph Co., of California, has laid across the bay at San Francisco to Oakland, about 4½ miles of a seven-conductor gutta-percha insulated submarine telephone cable. This cable was furnished in October, 1883, by the Bishop Gutta-Percha Works, of New York city. The cable is now in excellent working order and the telephone service through it to Sacramento, a distanc

The Atlanta, Ga., Exchange.—The telephone exchange is now one of the most important business factors in the thriving city of Atlanta. A little over two years ago it had but 112 subscribers. To-day its list includes 450, a very good indication of what good service and management can do. A small exchange has just been completed at Decatur, and is connected with Atlanta direct, without any extra tolls for the six miles of line. Other more distant towns will soon be brought into connection. A new switchboard, to accommodate 1,000 wires, is shortly to be placed in the central office. The construction work throughout the city is reported to be excellent. Mr. W. T. Gentry is the manager, and Mr. H. H. Jackson assistant manager.

Union Telephone Company.—Inquiries are made relative to the Union Telephone Company of New York State, owned principally in Boston and Lowell. The Union Company is said by the managers to be earning fully 6 per cent. on the capital, $100,000, over and above operating expenses and construction, but passed the April and July dividends, and will pass that of October, on account of a floating debt of about $12,000. Its earnings have suffered somewhat by the loss of the extra territorial business which it supposed it acquired in the counties of Washington, Warren and Saratoga, but which it appears that it could not claim under the purchase contract. It can control 15 miles around each exchange, but loses the trunk line business. It is thought possible that dividends may be resumed early in 1885.

Erie Interests.—The directors of the Erie Telephone Company held a meeting in Boston on Aug. 11, says the Lowell *Citizen*, and discussed a variety of matters of vital importance to the interests of the company. Messrs. A. A. Coburn and Francis Jewett were appointed a committee to investigate the alleged irregularities in the Northwestern division, and there was a general sentiment expressed in favor of a more rigid supervision of affairs. It was decided to secure the undivided services of Treasurer Glidden, and that gentleman accepting the trust, has resigned his position as Secretary of the New England Company and will devote his whole time to the interests of the Erie. His successor in the New England Company will probably be Auditor Boynton. Mr. Glidden will visit the various exchanges, examine the books and institute needed reforms in the system. It is rumored that Messrs. Bent and Downs will retire from active connection with the Erie, and that other changes will be made in the management of the company.

THE ELECTRIC LIGHT.

Ashland, Pa.—The streets of Ashland, Pa., were illuminated by electric light for the first time on the night of the 9th inst.

Protect the Working Girls.—Electric light is asked for as a means of protection to the respectable working girls who spend their brief leisure hours in the evening in the East River Park, of this city. At present the roughs avail themselves of the darkness to insult women there.

Current and Currency.—An American gentleman lately returned from Guadalajara, Mexico, says that there are electric lights in the plaza, but they are only lighted when the mint is running, as the mint engine is used also for the dynamos. The telephone system in this primitive city has 150 subscribers.

Remington Lights.—A dispatch of August 13 from Ilion, N. Y., says: Gen. Logan and Senator Miller, accompanied by their wives, visited the Remington arms manufactory here today. The visitors were shown through the works, and expressed much interest in the various departments of gun-making. A large room full of the new Remington electric lamps was lighted for their inspection.

The Van Depoele System.—We have just received from the Van Depoele Electric Light Company, Chicago, a copy of their beautiful and interesting catalogue. It contains a portrait and biographical sketch of Mr. Van Depoele, and a profusely illustrated description of his electric lighting system. The company deserve a great deal of credit for the energy with which they have built up their business in the West, and made their electric light a commercial success there. Of that success, the catalogue contains many striking proofs and instances.

New York City.—Part of the quarterly report of the Commissioner of Public Works is as follows: "The electric light has been extended into the following streets: Bleecker street from Broadway to Eighth avenue, East Broadway from Chatham street to Grand street, Eighth avenue from Bleecker street to Fourteenth street, South street from Whitehall to Grand street, West street from Battery place to West Eleventh street, Broadway from Battery place to Canal street, Gansevoort Market square, Tompkins square. There are now 23,084 gas lamps and 534 electric lights in use in the streets and parks of the city.

For Carriages.—The Consolidated Electric Company has in its exhibit at the London International Health Exhibition a set of carriage accumulators, constructed to slide under the coachman's seat. The apparatus consists of five ebonite cells, made quite tight, so that no acid can escape when the carriage moves. The cells, which are 9 in. high, 9 in. deep, and 4¼ in. wide, each contain three positive and four negative plates, made on the B. T. K. system. They are neatly fitted into a well made mahogany frame, and the P. and N. poles are marked. This little accumulator will light three lamps of 5 c. p. for five or six hours, and it is believed to be the smallest and most effective for its size of any secondary battery in the market. The frame, with cells complete, measures just 2 ft. in length.

Cholera Germs.—Some specimens of the peculiar germ which the now famous Dr. Koch has discovered in India, Egypt, and latterly in France, in the bodies of persons who have died of the cholera, and to the presence of which he attributes that terrible scourge, were exhibited for the first time in public in London, on July 17, at the Imperial Theatre, by the aid of a gigantic microscope. The germs—no longer in an active state—had been specially procured from the cholera district in the south of France. As magnified some two million times, and shown by the aid of the electric light, they appeared nearly of the size of the palm of one's hand. They were quite colorless, and in the form of coils representing circles and shapes not unlike the figure 8, precisely as described in Dr. Koch's work on the subject.

MISCELLANEOUS NOTES.

An American Electrician Decorated.—Dr. Cornelius Herz, who is an American by birth, has been made a commander in the Legion of Honor, for services in the cause of electrical science. He is the first foreign scientist who has been invested with this distinction.

Distinguished Foreigners.—The Secretary of the Electrical Exhibition has received a communication from the officers of the Royal Society of London to the effect that that body has appointed the following eminent scientists to represent it at the Exhibition: John Hopkinson, M. D., F. R. S.; W. H. Preece, C. E., F. R. S.; Lord Rayleigh, D. C. L., F. R. S., and Sir William Thomson, LL. D., F. R. S.

Death of Mrs. Edison.—On Saturday, the 9th inst., Mrs. Edison, wife of the celebrated inventor, died suddenly at Menlo Park, N. J. The funeral took place there on the afternoon of the 12th, and was attended by about 400 persons, including President S. B. Eaton and Vice-President E. H. Johnson, of the Edison companies; G. P. Lowery, José F. De Navarro and W. H. Roosevelt. A great many flowers were sent. The interment took place at Claremont Cemetery, Newark, N. J.

Fatal Thunderstorms in England.—Late reports indicate that the thunderstorms which swept over the north of England and Scotland on Aug. 12 were of almost unexampled severity. Many buildings in Edinburgh, in Leith and other cities were partially demolished by the lightning. Dundee was enveloped in dense darkness for an hour and traffic was for the time suspended. Several persons were killed by lightning, among the number the Earl of Lauderdale, who was overtaken by the storm while out riding.

STOCK QUOTATIONS.

Telegraph, telephone and electric light quotations are as follows on the New York Stock Exchange, the Boston Exchange and elsewhere:

Telegraph.—Am. Cable, b 56, a 59; Mutual Union, b 13½; Western Union, b 66⅝, a 66¾; Postal stock, b 4½, a 5¼; Postal sixes, b 40¾, a 40⅞.

With regard to the sweeping reduction of rates by the combination, friends of the Western Union Telegraph say that the United Telegraph Lines cannot successfully compete with that monopoly, and they may be right; but the United Lines are making the effort which confidence in their ability to succeed inspires. The people will get the advantage of a spirited rivalry.

Telephone.—American Bell, b 156; Erie, b 20½; Mexican, b 1¾, a 1⅞; New England, b 24, a 25; Tropical, b 1¾.

The New England Telephone Company earned about $25,000 net in July.

Mexican Telephone was dull at 1¾ bid, 1⅞ asked. The earnings of the company for the quarter ending June 30 were $7,369.34; disbursements, $5,851.48; net profit, $1,517.86. The statement for July shows 540 subscribers at the end of the month, a net gain of 14 over June. The earnings for the month were $2,446.67 from rentals and $570.18 from other sources, making $3,016.85. The expenses were $2,105.74; net profit, $911.11.

Electric Light.—American, b 9; American common, 2¼; Edison, b 100.

The American Company's dividend and opening of Reserve Fund creates a strong feeling in favor of that stock.

BUSINESS NOTICES.

Read the poetical announcement of Messrs. C. E. Jones & Bro., of Cincinnati, O.

W. B. Cleveland.—The electrical works of W. B. Cleveland, Cleveland, O., are busy. They are making a new type of dynamo and a new apparatus for incandescent lighting, and are wiring a large residence on Euclid avenue for the electric light, call bells, annunciators and electric gas burners.

The United Telegraph Lines.—We call attention to the card appearing in the first advertising page of this issue, of the United Telegraph Lines, relative to their sweeping reduction of rates on day and night messages. They consider that these reductions entitle them to the special patronage of the public, and there can be no doubt that they will lead a large increase of business. A promise is also held out of faithful service, and Mr. Bates is the man to keep his word.

New York Carbon Works.—These works, of which Mr. Henry Muller, Jr., is proprietor, are situated at 670 Hudson street. The factory is two stories high, and has a depth of 75 feet, with 25 feet frontage on Hudson. Mr. Muller uses pure gas carbon, and makes plates, cups, buttons, knobs, of all designs and shapes for electrical purposes. Having been in the business a number of years, he is fully acquainted with its requirements, and can fill orders with promptness and satisfaction to the purchaser. His factory is easily reached by the Eighth avenue cars from City Hall, or by the Elevated road.

OUR ILLUSTRATED RECORD OF ELECTRICAL PATENTS.

Edited by N. S. KEITH, Electrical Engineer and Expert, 9 Murray Street, New York.

PATENTS DATED JULY 29, 1884.

Armature Winding for Dynamo-Electric Machines; W. K. Freeman, of Brooklyn, N. Y., Assignor to the Monarch Electric Co. of N. Y..... 302,557

All of one bobbin or one side of the armature is in one armature division, while that portion of the same bobbin on the other side of the armature is divided between two divisions, one on either side of the diametrically opposite division.

Apparatus for Electrical Heating; J. S. Sellon, of Hatton Garden, England..... 302,673

A box made of insulating and fire-proof material has its sides perforated; and closely arranged therein are coils of wire-conductors of electric currents. These wires are made of such size and resistance that they become suitably heated by the supplied electric currents from any suitable source.

Armature for Dynamo-Electric Machines or Motors; W. K. Freeman, of Brooklyn, N. Y., Assignor to the Monarch Electric Co., of N. Y..... 302,554

Consists in building up a cylindrical armature core from a series of sector-shaped plates of iron, which plates are keyed to the armature shaft, and are disposed in sets in different longitudinal planes, so that those upon one side shall be separated from one another by a space equal to the thickness of the intervening plates of the other sets. The object is to provide against Foucault currents and for ventilation.

Apparatus for Winding Armatures of Dynamo-Electric Machines; W. B. Espeut, of Hyde Park, England, Assignor to W. M. Bullivant, of London, England..... 302,627

This is for armatures of the Gramme type. An annular reel-carrier is made so that it may be readily divided for introduction of the annular-armature core, and then fastened together. The reel, or spool, carrying the wire for the bobbin is mounted on this carrier so that, as the carrier is revolved around its centre, the reel is passed through the ring and delivers its wire, convolution by convolution, to the armature core. The details for accomplishing this previously known operation are the novelties of this patent.

Conduit for Gas, Fluid or Electric Wires; J. Marsden, Far Rockaway, N. Y..... 302,752

Means for connecting the sections of the conduit.

Electric Signal; A. D. Blodgett, of Boston, and H. D. Winton, of Wellesley Hills, Mass., Assignors to the Hall Electric Signal Co., of Meriden, Conn..... 302,821

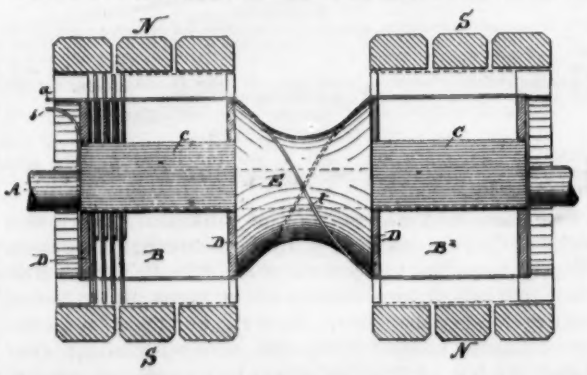
The electro-magnet itself is oscillated instead of the armature, which is stationary.

Electric Motor; E. T. Starr, of Philadelphia, Pa., Assignor to the S. S. White Dental Mfg. Co., of same place..... 302,793

The yoke carrying the brush-holder is movable both circumferentially and longitudinally with reference to the commutator.

Armature for Dynamo-Electric Machines or Motors; W. K. Freeman, of Brooklyn, N. Y., Assignor to the Monarch Electric Co. of N. Y..... 302,555

There are, in effect, two armatures *B* and *B²*, in series, on



one shaft *A*. The winding is done from *a* along the armature-core *B*, and these spirally over *E* as at *t*, and around the armature-core *B²*, spirally, as by the double-dotted line, over *E* to the armature-core *B* to end loop, or continue on the same course at *b*. The field-magnet poles are presented to the armatures in the order designated by the letters *NS, SN*.

Electric Arc Lamp; W. K. Freeman, of Brooklyn, N. Y., Assignor to the Monarch Electric Co., of N.Y. 302,553

A differential lamp, with the feed controlled by a clutch around the positive-carbon carrier. The clutch is operated by a bent lever connected with an armature which is oscillated on a horizontal plane by the differential action of magnets in the main and derived circuits respectively.

Field-of-Force Magnet for Dynamo-Electric Machines; W. K. Freeman, Brooklyn, N. Y., Assignor to the Monarch Electric Co., of New York..... 302,556

A form of combination of the magnet cores with the supports of the armature bearings.

Magnetic Window Shade; H. D. Winton, Wellesley Hills, Mass..... 302,616

A permanent magnet is on the shade and iron bars are on the sash.

Means for Applying Electric Motors to Cars; W. F. Sherman, of Chicago, Ill..... 302,596

The motor is located on the top of a car suspended from an overhead track.

Primary and Secondary Voltaic Battery; A. de Khotinsky, of Rotterdam, Netherlands..... 302,623

The plates are made of peculiar form, and are placed in shallow cells of suitable insulating material. The cells are placed in super-imposed layers.

Process of Making Incandescents; A. Cruto, Piossasco, Italy..... 302,827

Consists in first coating wire with carbon, then with an aluminous or alkaline silicate, and, finally, heating the coated wire in the presence of carbon compounds until an additional coating is laid on.

Photographers' Electric Retouching Device; J. F. Geesbergen and A. Géruzet, of Brussels, Belgium..... 302,836

Various details relating to a pencil containing a point having a rapid reciprocating movement caused by an electric motor actuated by a galvanic battery with which the pencil is connected by a flexible double conductor.

Secondary Battery; T. S. Sarney, of Camberwell, and J. M. Alprovidge, of Hern Hill, England..... 302,783

Consists in alternately coating the plates and reducing them by rolling until the desired thickness is obtained.